NEW PARASITIC COPEPODS FROM JAPANESE FISHES

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NEW PARASITIC COPEPODS FROM JAPANESE FISHES[1)]

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With Plates X–XII

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Introduction

Of the four new species described here, *Gangliopus tetrapturi* is the second member of the genus, giving sufficient information about the generic characters of the female which have not been worked out since GERSTAECKER (1854). We are indebted to the late Mr. Sadae TAKAHASHI for his generous supply of the material of this species. The other materials have been collected by one of us (YAMAGUTI) while he stayed at his villa at Tarumi, Kobe. *Pseudolernanthropus* n. g. is clearly distinguishable from *Lernanthropus* only when the concealed parts of the body are dissected out for examination. The male of *Caligus spinosus* is described for the first time in this paper, although the female was recorded by the senior author some 20 years before.

1) Contributions from the Tamano Marine Laboratory, Okayama University, No. 68.

PANDARIDAE

1. *Gangliopus tetrapturi* n. sp.

(Pl. X, Figs. 1–16)

Habitat: Gill of *Tetrapturus mitsukurii* JORDAN et SNYDER.

Material: Four gravid females without egg strings.

Locality and date: Suô Harbor, Formosa; February, 1932.

Body 11.3–12 mm long. Carapace suborbicular, 7.0–7.5 mm long by 5.9–6.0 mm broad, with a distinct median notch on frontal margin, two (anterior and posterior) inconspicuous notches on each lateral margin, and paired triangular posterior lobes; cephalic area not clearly differentiated from thoracic area; each lateral lobe separated from median area by longitudinal groove originating from the anterior lateral notch. On the ventral side along the lateral margins of the carapace and its posterior lobes there is a thick, cuticular, linear, submarginal beam provided with a serrate fringe which arises from inside the inconspicuous marginal notch lying opposite the distal segment of the first antenna. Opposite the proximal segment of this antenna is a knob-like adhesion pad on the submarginal ventral surface of the carapace. There is no eye-spot. Frontal plate largely showing in dorsal view, with its basal portion covered up by carapace, and its blunt distal end projecting laterally over proximal segment of first antenna. On each anterolateral margin of the carapace there is a slight sclerotized emargination just opposite the distal end of the frontal plate. Dorsal plates of free second thoracic segment wide apart, those of third and fourth segments meeting on median line. Genital segment quadrangular, 2.2–2.35 mm long in median axis, with a pair of rounded posterior lobes and a pair of blunt-conical, strongly sclerotized processes, on the ventral side of which must have been attached the egg strings. Sixth thoracic segment 0.6–0.75 × 0.93–1.05 mm, attached to genital segment between its posterior lobes. Abdomen squarish, 1.05 × 1.4–1.5 mm, attached to genital segment by its anterodorsal surface, its conical lateral angle projecting as far as lateral margin of caudal ramus, posterior corner broadly rounded, reaching as far as posterior end of sixth segment lamina or a little beyond it. Caudal ramus 0.26–0.34 × 0.22–0.28 mm, with a blunt pointed spine on dorsal surface of its blunt posterior end and one seta on each lateral margin; posteromedial to each seta is a smaller spine on the dorsal side very close to the margin. Egg string very long, about 0.35 mm wide; eggs uniseriate.

First antenna 2-segmented; basal segment about 0.65 mm long, wider than distal segment, only slightly curved, armed with 23 spines of varying length on distal ventral surface; distal segment rod-shaped, 0.28 × 0.12 mm, with a minute dorsal seta near middle of posterior margin and several setae at tip. Second antenna forming a long prehensile claw. Mouth tube long and slender, terminating in a blunt tip with very fine marginal serration; mandible slender, its blade

with 10 minute teeth. Maxilla forming a malleolar projection triangular or bean-shaped in ventral view; its palp lying just in front consists of a nodular base and a terminal spine. Distal segment of first maxilliped terminating in an apically curved claw provided on each side with a row of pointed teeth and submarginal rows of punctiform rudimentary spines; on this segment close to the base of the claw there are another, much smaller, bilaterally serrate, accessory claw and a two-segmented rod consisting of a small claviform distal segment bearing a rudimentary seta at the lip and a terminally shaggy proximal segment bearing a simple marginal seta about the middle. Second maxilliped cheliform, with two ventral adhesion pads, one of which is at the base and the other on the ventro-medial side of the knob which bears a stout pointed triangular tooth shutting against the principal claw.

Basipod of first leg with minute spines at its backwardly produced posterior end, and two fine setae (one anteriorly and the other on posteromedial margin), and on the ventral surface there are two adhesion pads, the larger one of which is covered with exceedingly fine spines, while the smaller one lying anteromedial to the larger bears larger blunt spines; rami of first leg one-segmented, although the endopod shows a transverse groove of segmentation on the dorsal side alone at the level where a sharp spine projects forward on the anterior margin; on the anterior margin distal to this spine is a rather flat spined pad; at the distal end of the first endopod there are a short, blunt-pointed, ventro-apical process bearing a row of very fine spines along the posterior margin, and six pointed marginal spines, of which three are on the anterior margin and the other three on the posterior margin. First exopod 2-segmented; basal segment shorter than distal segment, with its ventral surface occupied by large pad with fine file-like surface; distal segment spined along anterior margin as well as on swollen distal end, the spines diminishing in size from the anterior margion toward the postero-lateral corner which is more prominent than the anterolateral corner; on the posterior margin of this segment there is a row of three comparatively large spines. Basipod of second leg with two large adhesion pads with file-like surface on ventral side (one at base of proximal segment and the other at distal end of distal segment) and a smaller one at outer corner of proximal segment; this small pad is covered with spines larger than those of the larger pad. Between the two proximal segments of the second legs is a large, apically notched, inverted conical apron covered marginally and submarginally with very fine blunt spines, with a finely striated, circular pad immediately in front. Rami of second leg 2-segmented; proximal segment of endopod much shorter than distal segment, with file-like adhesion pad on its posterior ventrolateral end; distal segment covered with rudimentary spines along posterior margin, armed with a row of 5 spines along distal anterior margin, the most distal spines tending to lie on the dorsal side of the tip. Two segments of second exopod nearly equal in

length, proximal segment enlarged distally, with a stout spine at its posterolateral corner, and a flat lateral pad covered with minute spines, and a more prominent, but smaller, ventral pad covered with larger spines; distal segment finely spinose on outer margin, provided on medioventral margin with a row of 10 blunt spines which tend to become acute as they proceed toward the dorsal side of the tip. Proximal segment of third basipod spined distally, with a circular spiny pad at proximal end; distal segment finely spined along its broadly rounded posterior margin as well as at distal end; apron between two basipods of third legs rounded quadrangular, notched at apex and spined marginally and submarginally like the foregoing apron. Rami of third leg 2-segmented; proximal segment of endopod spined laterally like distal segment, latter much longer than proximal segment, with three pointed spines on dorsal side of its tip; proximal segment of exopod short, spined along outer margin like distal segment which is provided distally with a diagonal row of seven spines. Basipod of fourth leg approximately quadrangular, spined on outer and inner margins, with a inconspicuous spiny pad medioventrally near the widely notched sternal plate and a rounded spiny lobe posteromedially; rami 1-segmented; endopod shorter than exopod, with two curved sharp spines on dorsal side of its very finely spinose tip; exopod spined along entire outer margin and a row of six stout spines around the distal end (two straight sharp spines along the distal inner margin, one somewhat blunt spine ventro-apically, two curved pointed spines dorsally at tip and the last, smallest, blunt spine dorsally near distal outer margin). Fifth leg represented by a 2-segmented inner process and an outer seta with papilliform base; the proximal segment of this process bears a minute seta posteroventrally, and the distal segment is a blunt spine with a subapical tip dorsally.

This species differs from the genotype, the only known member of the genus, in the body shape, the armature of legs and the host. GERSTAECKER states that the abdomen of the female is two-segmented and so illustrates in his figure 10, but in our species the squarish abdomen is attached to the genital segment by its anterodorsal surface and there is no segment ventrally between the abdomen and the genital segment; the "Blättchen des ersten Gliedes" of GERSTAECKER, interpreted by WILSON as rudimentary legs, exactly corresponding to the protuberance of the genital segment to which the egg string is attached. From the way in which the abdomen is attached to the genital segment it is doubtful that between these two segments there is another free segment which is regarded by GERSTAECKER as the basal joint of the abdomen and by WILSON as the sixth thoracic joint. Further, GERSTAECKER does not mention the presence of the fifth legs on the ventral side of the genital segment and the sixth segment lamina in the posterior sinus of the genital segment, although the last segment shown in the dorsal view of the female (Fig. 9) may represent the sixth segment lamina.

ANTHOSOMATIDAE

2. *Pseudolernanthropus epinepheli* n. g., n. sp.

(Pl. XI, Figs. 17–28)

Habitat: Gill of *Epinephelus akaara* (TEMM. et SCHLEG.)

Material: One young and two gravid females.

Locality and date: Tarumi, Kobe; August 3, 1936.

Body 4.0–6.0 mm long. Cephalothorax broadly rounded or rather truncated anteriorly, with anterolateral lobes reaching as far forward as anterior margin of frontal plate and projecting ventrad immediately lateral to second antennae in form of longitudinally elongated pad, and lateral part extending like symmetrical wing-like lobes; posterior margin truncate and shallowly concave overlapping anterior end of trunk. Trunk covered dorsally by approximately oblong-quadrangular carapace which is 2.8–4.5 mm long, by 2.0–2.5 mm wide, and divided by deep paired lateral sinuses into an anterior thoracic portion with posterolateral lobes and a large posterior dorsal plate with a distinct median notch on truncated or broadly rounded posterior margin. Fifth thoracic segment with convex sides differentiated in front of genital segment which is heavily sclerotized and carries a rounded spermatotheca at each posterolateral corner. Abdomen lacking. Caudal rami tapered posteriorly, each terminating in a minute simple seta, provided on dorsolateral margin with two simple setae with papilliform base. Egg strings looped several times, completely covered up by dorsal plate, without projecting backward beyond posterior margin of dorsal plate, so that they are not visible in dorsal view though partly showing in ventral view; their length must be enormous, though not measured with certainty; eggs discoid.

First antenna arising sideways from frontal plate, which projects ventrally in form of a flattened cone, 7-segmented, though the fourth and fifth segments are rather indistinct; second and third segments each with one minute seta, terminal segment tipped with about 10 minute setae. Second antenna uncinate, very stout, 2-segmented; terminal claw with a slight elevation of concave surface near its tip. Mandible slender, with 9 teeth on its terminal blade. Maxilla divided into four nodular lobes. First maxilliped 3-segmented, basal segment stout, longer than other two segments combined; terminal segment small, bilaterally toothed. Second maxilliped uncinate, apparently 3-segmented, stouter than first maxilliped, basal segment longer than other two segments combined, with a small knob opposite the incurved tip of terminal claw which is finely serrate on the inner margin. Basipod of first leg forming a prominent rounded knob lateral to exopod, with a simple seta medial to endopod; exopod carpal, with 5 teeth along its broad apical margin; endopod a blunt rod devoid of spines or setae. Second leg is seen near anterior end of trunk as a nodular projection, on the posterolateral side of which is a simple seta with prominent base, and which is produced backward

into a blunt-pointed process corresponding to endopod of first leg; a small carpal exopod with a rudimentary spine at each posterior corner arising from the outer side of this process near its base. Third leg projects ventrad in form of a saddle, at the base of which it divides into two laminate rami of nearly same length; these rami extend backward along each other and reach to near the posterior margin of the dorsal plate, the inner ramus (endopod) is a little narrower (0.7–0.75 mm) than the outer and blunt-pointed, without marginal setae; the outer ramus (exopod) is about 1.0 mm wide at the level where it unites with the above mentioned posterolateral lobe of the trunk carapace, with a narrow sinus between, and broadly rounded posteriorly; on the notched lateral margin of this ramus is a simple seta set on a prominent cylindrical base. Fourth leg, 0.2–0.25 mm wide at the stem, is divided into two laminate rami overlapping each other and completely covered up by dorsal plate; both rami are more strongly convex on the outer margin than on the inner, with the posteromedial or posterior margin produced into a digitiform process 0.5–0.6 mm long by 0.07 mm broad; These processes usually do not project backward beyond the posterior margin of the dorsal plate. The ventral inner ramus (endopod) is about 0.7–0.8 mm in maximum width behind the middle and about 0.2 mm wide at its base and devoid of marginal setae, while the dorsal outer ramus (exopod) is 1.0 mm or more in maximum width behind the middle and about 0.3 mm wide at base, and bears a simple seta with cylindrical base similar to that of the third exopod on the outer margin a little behind the level of bifurcation of the two rami. Fifth leg represented by a rudimentary appendage consisting of a short, blunt, spiniform seta and a cylindrical base, situated at each posterolateral corner of fifth segment.

The present genus differs from *Lernanthropus* in complete absence of the abdomen and in the egg strings being looped several times and covered up by the dorsal plate. Although the egg strings are looped and concealed in dorsal view by the dorsal plate in *Lernanthropus Petersi* VAN BENEDEN (1857), the second thoracic segment is separated from the rest and the third legs are quite different from those of the present species, and it is not certain whether the abdomen is lacking or not. In spite of these differences we prefer to assign VAN BENEDEN's species to *Pseudolernanthropus* which is defined as follows:

Pseudolernanthropus n. g.

Generic diagnosis.—Anthosomatidae: Male unknown. Female: Head fused with first thoracic segment; lateral margin of carapace wing-like; second, third and fourth thoracic segments fused together, fifth differentiated. Genital segment small, strongly sclerotized; abdomen lacking; caudal ramus tapering posteriorly and terminating in a simple seta. Egg strings unusually long, looped several times and concealed in dorsal view. Trunk, caudal rami, third to fifth legs and

egg strings are all covered up dorsally by trunk carapace, which is divided into a thoracic portion with paired posterolateral lobes and a dorsal plate. First antenna small, 7-segmented, provided with a few short setae. Second antenna 2-segmented, strongly prehensile. Mouth tube conical; mandible slender, with toothed blade. Maxilla with large common base, divided into four rami. First maxilliped with bilaterally toothed terminal claw. Second maxilliped with terminal claw finely serrate on distal inner margin. First four pairs of legs biramose; first two pairs with 1-segmented rami; third and fourth pairs with laminate rami extending backward; fifth leg uniramose, rudimentary. Parasitic on marine fishes.

Genotype: *P. epinepheli* n. sp.

Other species: *P. petersi* (VAN BENEDEN, 1857) n. comb.

=*Lernanthropus petersi* BENEDEN on *Serranus goliath*; Mozambique.

Also on *Serranus* sp. (?), Congo.

CALIGIDAE

3. *Caligus spinosus* YAMAGUTI, 1939

(Pl. XI, Figs. 29–39)

Two males and five females were found on the gills of *Seriola quinquefasciatus* at Tarumi on July 31 and August 29, 1938. The male is described here for the first time from this material.

MALE. Body 2.1–2.4 mm long, paler than female. Carapace orbicular, 1.15–1.25×1.32–1.37 mm; frontal plate prominent on each side of conspicuous median notch; lunules about 0.15 mm in diameter, 0.33–0.35 mm apart from each other; in the dorsal view the dorsal transverse rib of each lateral lobe is more distinctly continuous with the short longitudinal ventral rib than in the female, in which the connection being obscure, the former appears like a mere transverse rib; median lobe about 0.52 mm broad at level of rounded lateral prominence, with posterior margin nearly straight. The two spiny areas observed on the ventral side of the third thoracic segment of the female are seen in the male, too. Fourth thoracic segment contracted anteriorly, 0.21–0.25 mm long, 0.3–0.33 mm broad through bases of fourth legs. Genital segment much narrower than that of female, 0.4–0.5×0.32–0.33 mm, with a slight marginal notch, where the rudiment of the fifth leg is attached; each posterolateral corner conical, with rudiment of sixth leg. Abdomen cylindrical, 0.32–0.36×0.22–0.23 mm, apparently 1-segmented though constricted about middle. Caudal ramus curved inward, 0.08×0.06–0.07 mm; each with 3 terminal plumose setae and another smaller seta on outer margin; on the ventral side of the base of this lateral seta is a very minute simple seta.

Basal segment of first antenna 0.17 mm long, distal segment about 0.25 mm long by 30 μ broad, armed with setae as in female. Second antenna with elongate

serrated area on ventromedial side of basal segment and a horseshoe-shaped serrated area on middle segment; latter extending from ventral side of the segment to its outer and inner margins; terminal claw well curved, with two small setae at base ventrally. Maxillary hook similar to that of female. Maxilla bifid, inner ramus much smaller than other ramus as in female; palp with one long and two minute setae. Mandible with 12 pointed teeth on its terminal blade. First and second maxillipeds as in female. Branches of furca divergent, slightly curved inwards, without flange.

First to fourth legs armed with spines and setae as in female. Fifth leg represented by a small anterior simple seta and three similar posterior setae set close together; sixth leg on posterolateral corner reduced to three minute closely massed setae, one of which is seen under hight power of magnification alone.

4. *Lepeophtheirus paralichthydis* n. sp.

(Pl. XII, Figs. 40–53)

Habitat: Body surface of *Paralichthys olivaceus* (TEMM. et SCHLEG.).

Material: Three mature females without egg strings.

Locality and date: Tarumi, Kobe; July 31, 1938.

Body 6.2–6.4 mm long. Carapace orbicular, 3.75–4.1×3.35–3.8 mm, with a pair of chitinous longitudinal ribs and eye spots anteriorly; cephalic and thoracic areas and lateral lobes clearly delimited one from another; median lobe truncate posteriorly, about 1.5 mm wide; frontal plate well defined, with median notch anteriorly. Free fourth thoracic segment 0.4–0.5×0.85–1.0 mm, constricted in front, may or may not be clearly defined from genital segment. Genital segment 1.75–2.0×1.54–1.7 mm, with convex sides and rounded posterior lobes; spermatotheca elliptical, 0.22–0.24×0.11–0.12 mm. Abdomen 2-segmented, 0.3–0.35 mm long, proximal segment 0.62–0.65 mm wide, shorter than distal segment, occupying wide posterior sinus of genital segment. Caudal ramus short, curved inward, 80–90×80–100 μ, with two small setae on outer margin and four terminal setae, one of which is very small and lies at the posteromedial corner.

Basal segment of first antenna wide, consisting of three fused segments, with numerous plumose setae along its anterior margin and two setae on dorsal side near distal anterior margin; terminal segment rod-shaped, constricted at base, about 0.15 mm long by 0.07 mm wide, with 13 simple setae at tip and one on posterior margin. Second antenna 3-segmented; basal segment with a large quadrangular oar-like process ventrally, terminal claw curved at right angles near its tip, with one minute seta on anterior margin and another on ventral side of base. Maxillary hook strongly developed, with two papillae, each bearing three fine hairs, on ventral side of its base. Mandible with 12 pointed teeth along its curved blade. Maxilla with stout base and two large corner projections, the apical

margin of which looks like a broad oar; maxillary palp with one large and two minute setae close together. Behind the inner projection of the maxilla is a very stout, isolated, spiniform process. First maxilliped terminating in two flanged setae. Second maxilliped with a stout, blunt, incurved process at base of second segment; its terminal claw with a simple seta on concave side. Branches of furca very wide, oar-like, with straight inner margin and convex outer margin. Immediately posterolateral to each furcal branch is a ventrally pointing spiniform process.

Basal segment of first leg with an oblique, heavily sclerotized, shield-like, ventral fold in front of the seta which lies on the posteroventral side of the segment near its base, and another seta at prominnet anterolateral corner; terminal segment with three large plumose setae on posterior margin and one small plumose seta and three distally flanged spiniform claws at tip. Sternal apron between second basipods with two symmetrical, transversely elongated, elliptical shields, the margin of which is heavily sclerotized; proximal segment of second basipod with a large plumose seta on posterior margin and a shield-like fold on anteroventral side; distal segment of second basipod with a seta just in front of its posterior marginal fringe and another at anterolateral corner. Rami of second and third legs are armed with spines and setae as follows:

Second exopod I-1, I-1, II-6; second endopod 0-1, 0-2, 0-6

Third exopod I-1, III-4; third endopod 0-1, 0-6

The marginal hook of the third leg consists of a basal segment bearing a pectinate apical fringe and a nearly straight terminal spine which is about 0.1 mm long and bilaterally flanged and projects backward at nearly right angles to the basal segment. Basal segment of fourth leg stout, just as long as three distal segments combined; second segment with a small claw-like terminal spine covered by fringe, third segment with longer, narrowly flanged, terminal spine, fourth segment tipped with three narrowly flanged spines of graded length; fifth leg on ventral side of genital segment near its posterior end, reduced to a slender outer seta and a carpal inner ramus bearing three slender setae and an extremely fine hair on its truncate posterior margin, the base of each seta covered ventrally by a broadly truncated cuticular fold.

This species is characterized by the basal spine of the second antenna, the two corner projections of the maxilla, and the two branches of the furca all being oar-like, and by the presence of sclerotized shield-like folds on the basal segments of the first and second legs and on the sternal apron of the third thoracic segment. In general body shape it bears a certain resemblance to *Lepeophtheirus marginatus* BERE (1936) from related hosts, but in the latter species any of the features characteristic of our species have been observed and the genital segment has no posterior lobes.

DICHELESTIIDAE

5. *Hatschekia trachuri* n. sp.

(Pl. XII, Figs. 54–60)

Habitat: Gills of *Trachurus trachuri* LINNÉ.

Material: 12 mature females without egg strings.

Locality and date: Tarumi, Kobe; August 18, 1938.

Body 1.8–2.35 mm long, slender. Head approximately rounded 0.15–0.2×0.15–0.22 mm, its posterior margin strongly convex, may extend over the second thoracic segment. Dorsal chitinous frame of head consisting of median rib and paired lateral arches, all joining together near anterior end of head. Thorax constricted off from head, continued backward into trunk with or without slight constriction between. Trunk subcylindrical, 1.6–2.15 mm long, with maximum width of 0.17–2.28 mm toward middle. Abdomen small, conical, 0.1–0.12×0.2 mm. Caudal rami subcylindrical, 80–90×30–40 μ, each with five small setae at tip and one on outer margin.

First antenna indistinctly segmented, with a number of short spiniform setae along anteroventral margin and one seta on posterodorsal side distal to middle, and 11 setae terminally and subterminally, four of them on posterior margin being extremely fine. Second antenna prehensile, with a membranous extension of body on outer side of its basal portion. Maxilla biramose, with two setae for each ramus. Behind the maxilla is a blunt-pointed spiniform process arising from chitinous beam which unites with its fellow of the other side immediately behind the mouth tube. Mandibular blade apparently without teeth. Maxilliped provided posteroventrally at base with a blunt claviform process directed backward and outward; terminal claw bifid at tip.

First and second legs biramose; exopod 2-segmented, apparently 1-segmented, though the second endopod may show a very slight constriction at the level where a rudimentary seta is seen on the the inner side occasionally. Rami armed with setae as follows:

First exopod 1, 4; endopod 5

Second exopod 1, 4; endopod 4 or 5.

This species differs from the most closely related Japanese species with a long slender genital segment (*H. pagrosoni* YAMAGUTI, 1939; *H. longigenitalis* YAMAGUTI, 1954 and *H. gracilis* YAMAGUTI, 1954) in the number of setae on the first and second legs as shown in the following table:

First exopod	*H. pagrosomi*	*H. longigenitalis*	*H. gracilis*	*H. trachuri*
First exopod	0, 4	1, 3	1, 5	1, 4
First endopod	0, 5	5	5	5
Second exopod	1, 3	1, 2	1, 3	1, 3
Second endopod	1, 4	4	6	4 or 5

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EXPLANATION OF PLATES X–XII

PLATE X

Figs. 1–16. *Gangliopus tetrapturi* n. sp., female.
1. Female, dorsal view. 2. Female, ventral view. 3. Posterior extremity, dorsal view. 4. Same, ventral view. 5. First antenna. 6. Second antenna. 7. Tip of mouth tube. 8. Mouth tube, maxillae and their palps. 9. First maxilliped. 10. Distal end of same. 11. Second maxilliped. 12. First leg. 13. Second leg. 14. Third leg. 15. Fourth leg. 16. Fifth leg.

PLATE XI

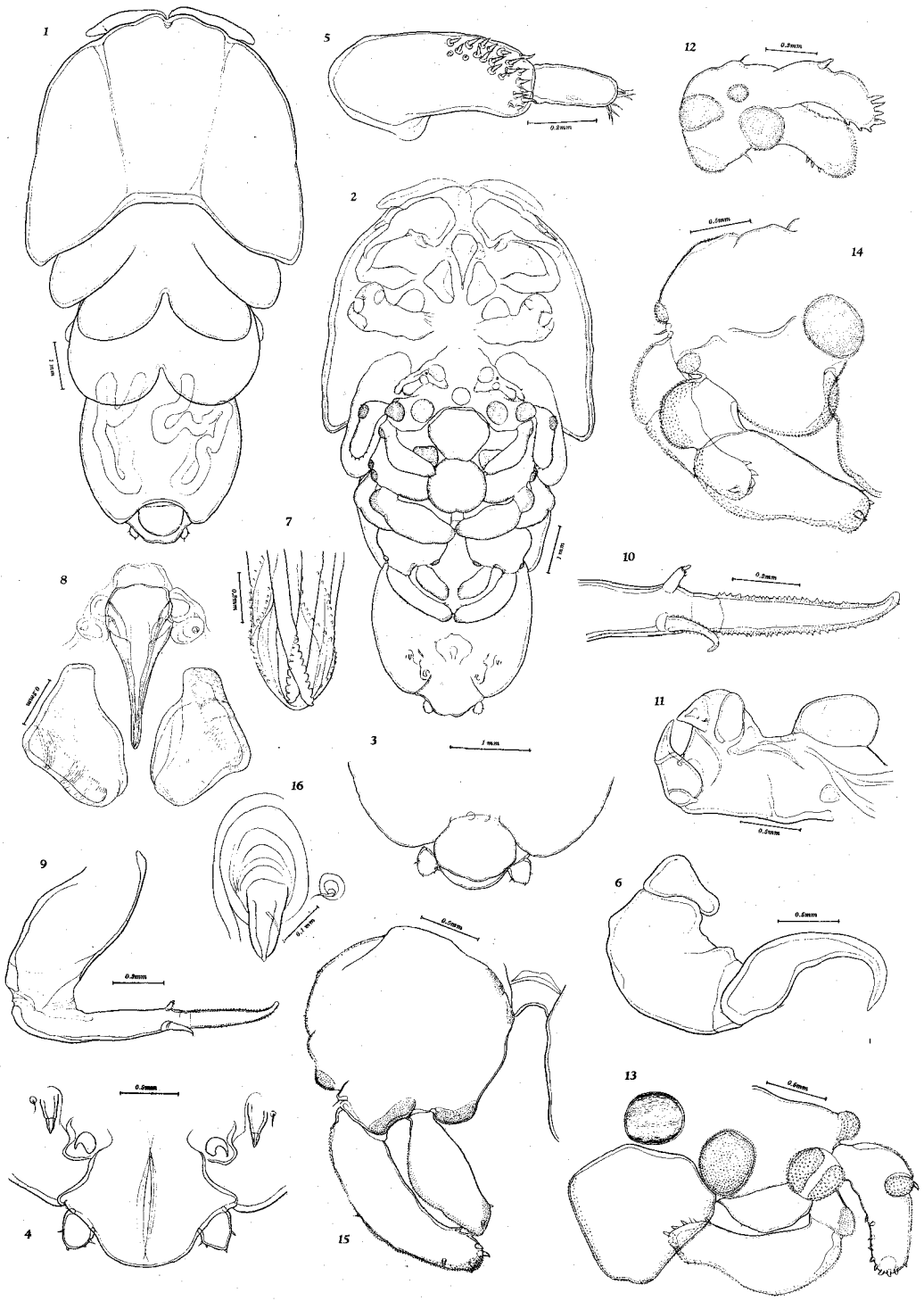
Figs. 17–28. *Pseudolernanthropus epinepheli* n. g., n. sp., female.
17. Female, dorsal view. 18. Posterior extremity, ventral view (egg strings omitted). 19. Egg string. 20. First antenna. 21. Second antenna. 22. Mandible. 23. Maxilla. 24. First maxilliped. 25. Second maxilliped. 26. First antenna. 27. Second antenna. 28. Third leg.

Figs. 29–39. *Caligus spinosus* YAMAGUTI, 1939, male.
29. Male, dorsal view. 30. First antenna. 31. Second antenna. 32. Mandible. 33. Maxilla. 34. Second antenna. 35. Furca. 36. First leg. 37. Third leg. 38. Fourth leg. 39. Fifth and sixth legs.

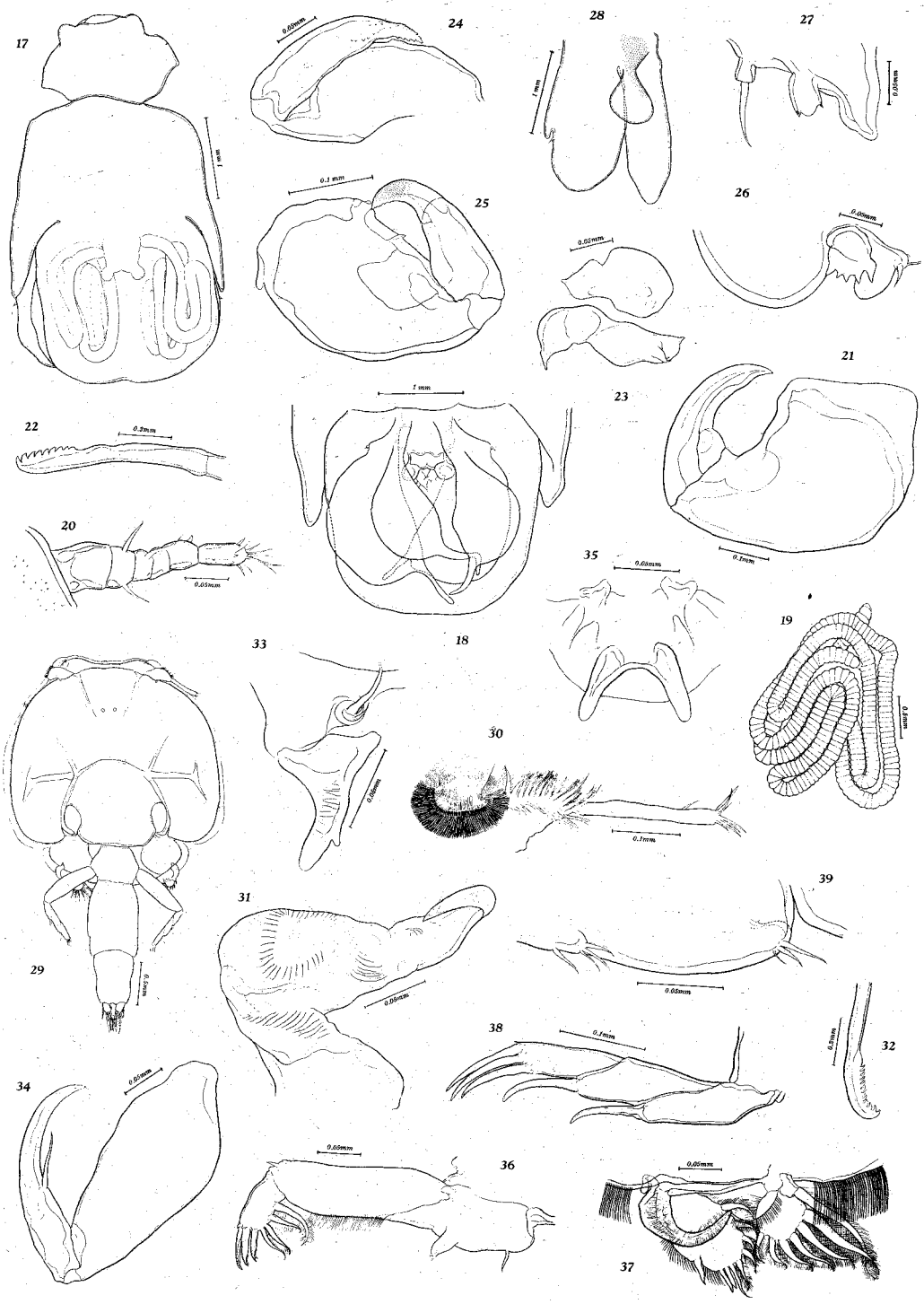
PLATE XII

Figs. 40–53. *Lepeophtheirus paralichthydis* n. sp., female.
40. Female, dorsal view. 41. First antenna. 42. Second antenna. 43. Maxillary hook. 44. Mandible. 45. Maxilla and postmaxillary spine. 46. First maxilliped. 47. Second maxilliped. 48. Furca. 49. First leg. 50. Second leg. 51. Third leg. 52. Fouth leg. 53. Fifth leg and spermatothecae.

Figs. 54–60. *Hatschekia trachuri* n. sp., female.
54. Female, dorsal view. 55. First antenna. 56. Second antenna. 57. Maxilla and mandible. 58. Second maxilliped. 59. First leg. 60. Second leg.



S. YAMAGUTI AND T. YAMASU: NEW PARASITIC COPEPODS FROM JAPANESE FISHES.



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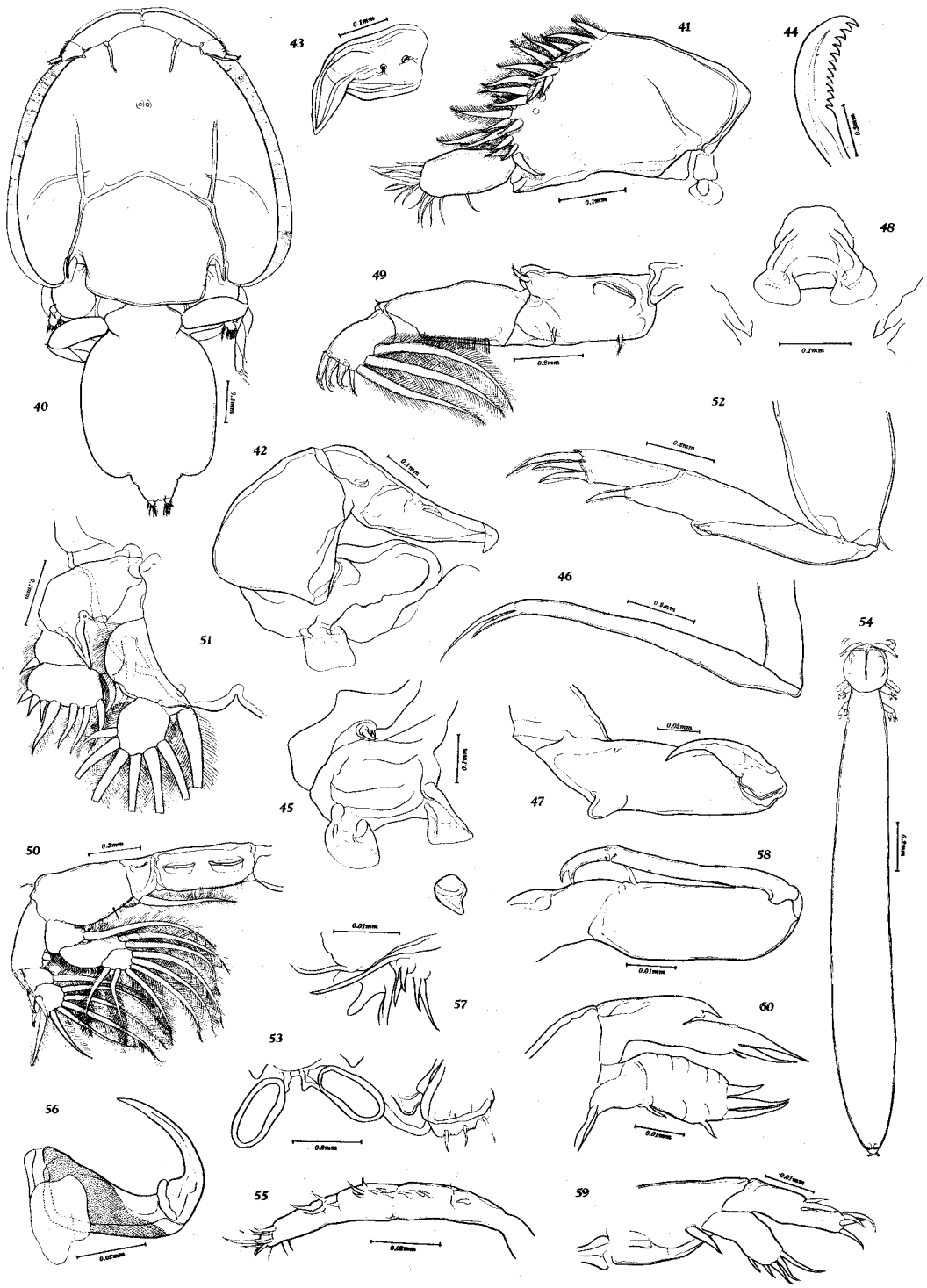

S. YAMAGUTI AND T. YAMASU: NEW PARASITIC COPEPODS FROM JAPANESE FISHES.